

Department of Mechanical Engineering

MEC 262 Engineering Dynamics SPRING, 2025

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Part 1: Course Overview

Course Information:

Course title: Engineering Dynamics

Course catalog # and section: MEC 262 Section 1

Credit hours: 3

Semester: Spring 2025

Course Meeting Time/Location: Tu/Th/Fr 12:30PM - 1:25PM FREY HALL 104

Recitations:

MEC 262 R01: Fri 08:25AM – 09:20AM FREY HALL 201 MEC 262 R02: Fri 11:00AM – 11:55AM MELVILLE LBR W4525 MEC 262 R03: Fri 09:30AM – 10:25PM FREY HALL 201

Prerequisites: MEC 260

Course Description: This Engineering Dynamics (MEC 262) class focuses on the vectorial kinematics and dynamics of particles and rigid bodies. The students learn to represent and compute displacement, velocity, and acceleration of particles and rigid bodies in different coordinate systems. Further upon, they learn to relate forces and motions of particles and rigid bodies using Newton's laws and Newton-Euler equations. Free, forced, and damped vibrations of particles and rigid bodies are presented in the end.

Instructor Information:

Instructor name: William Stewart

Instructor's Stony Brook email: william.stewart@stonybrook.edu

Instructor's phone number: 631-632-8342

Office location and hours:

In Person: Heavy Engineering 214 Thursdays 10:30am-12:00pm Via Zoom: Wednesdays and Thursdays 10:30am-12:00pm https://stonybrook.zoom.us/my/wstewart

Required Text and Materials:

For this course you will be required to purchase McGraw-Hill Education Connect® access for Connect-Semester Online Access or Access Card for **Engineering Dynamics, 3rd edition by Gray, Costanzo, and Plesha.** The Connect Access

includes eBook. You are not required to have a print text and please be aware if you purchase a used textbook you will still need to purchase Connect access.

Connect codes are available for purchase at the SBU Online bookstore or through Connect directly. Additionally, if you would like a print version of the text to accompany the eBook in Connect, a print-upgrade option is available via Connect once you log on to the Connect web site.

Title: Engineering Dynamics: Dynamics (USCS edition) + Connect Access Card for Dynamics

Authors: Gary Gray; Francesco Costanzo; Michael Plesha

Edition: 3rd

ISBN: 9781259877162 (this ISBN is for our book store only and is not searchable on the internet.)

Publisher: McGraw-Hill Higher Education

Classroom Expectations and Information:

- Class cancellation or delay: In the event that our class is cancelled, you will be notified via your stonybrook.edu email. In the event of inclement weather, you can check <u>www.stonybrook.edu</u> for updates on weather related delays or cancellations.
- **Classroom environment:** It is important for everyone that we maintain a positive and respectful learning environment both in class and online. We treat others and their ideas and experiences with respect and tolerance. If you have concerns about the material or class discussions, please contact me.
- How we will communicate: For course-related questions and other personal/private issues, the preferred method of contact is via email listed at the top of this syllabus. I will make every effort to respond as quickly as I can. When sending emails please include the course number in the subject line. Your Stony Brook University email must be used for all University related communications. You must have an active Stony Brook University e-mail account and access to the Internet. All instructor correspondence will be sent to your SBU e-mail account. Please plan on checking your SBU email account regularly for course related messages. To log in to Stony Brook Google Mail, go to <u>http://www.stonybrook.edu/mycloud</u> and sign in with your NetID and password. If you would like to speak to me, you may come to my office hours.
- *Math and Statics Prerequisites:* From your pre-requisite classes, you should have acquired a working knowledge of: Basic Trigonometry and Geometry (sines, cosines, basic trigonometry formula, etc.), Vector Calculus (differentiating and integrating vector functions), Vector Algebra (adding two vectors, Dot and Cross products, etc.), Free Body Diagrams (FBD), and Differential and Integral Calculus.

Review some <u>Academic Success Strategies</u> and visit the <u>Student Resources</u> page to ensure that you are successful in this course.

Technical Requirements:

Having a reliable computer and Internet connection throughout the term is required. **Caution!** It may not be possible to submit the files required for your assignments using a smartphone or tablet. If you need to borrow a laptop, please visit <u>SBU's Laptop Loan</u> <u>Program</u>.

Technical Assistance:

If you need technical assistance, see McGraw-Hill Connect Support at <u>https://mh.my.site.com/CXG/s/</u>.

Part 2: Course Learning Outcomes

Learning Objectives and Activities:

Upon completion of the course, students will be able to:

- 1. Determine the position, velocity and acceleration of a particle and system of particles in Cartesian, Polar as well as Normal and Tangential coordinate systems.
- Draw Free Body Diagrams and apply Newton's laws of motion to calculate (1) the displacement, velocity, and acceleration of a particle system caused by given forces, and (2) the forces needed for a particle system to move in a prescribed way.
- 3. Compute work, potential energy and kinetic energy for particle(s), and apply work-energy approach to problems where forces and acceleration are not primary quantities of interest and to use these principles to obtain velocity, displacement, and the work done by external forces
- 4. Compute Momentum and Impulse of particle(s) and apply Momentum-Impulse approach to problems where velocity, time, and forces are related in a more natural way.
- 5. Determine the velocity and acceleration components of a system of connected rigid bodies with pinned, sliding and rolling connections.
- 6. Draw Free Body Diagram and apply Newton-Euler equations to relate forces and moments acting on rigid bodies in planar motion with their linear and angular acceleration.
- 7. Compute potential- and kinetic-energy for a system of interconnected rigid bodies moving in a plane, and apply work-energy principle to the problems where forces and acceleration are not primary quantities of interest and to use these principles to obtain velocity, displacement, and the work done by external forces.
- 8. Derive and solve differential equation of motions for particles and rigid bodies under free, forced, and damped vibrations.

Assignments and Expectations:

- For this class, homework consists of all problems in the book, chapters 12-19.
- A portion of this homework will be collected and graded. The graded portion will be completed in McGraw-Hill Connect which can be reached through https://connect.mheducation.com/.
- For each graded problem, you will have unlimited attempts. Your highest score will be recorded on Brightspace. Do not accept less than 100%.
- Homework will be automatically submitted in Connect at the time and date due. Solutions can be accessed through Connect 1 hour after the homework is due.
- Please contact McGraw-Hill or a TA if you have problems with Connect.
- In addition to the problems graded on McGraw-Hill Connect, one or two problems a week will need to be hand written. These are professional documents: no scraggly fringe from ripping out of a notebook, legible handwriting, and good organization. These will be uploaded to Brightspace. Due to the nature of manually grading, the hand written problems cannot be accepted late. To

compensate, the lowest two scoring homeworks will automatically be dropped at the end of the semester.

Exams:

- All exams will be closed book and closed notes. An exam absence will be scored as a zero. Make-up exam policy is consistent with university policy.
- You must bring your Stony Brook ID, two or more pencils, and an approved scientific calculator to each exam.
- The dates and times will be announced in advance.

Assessment and ABET Student Outcomes:

The relevant ABET Student Outcomes are:

 An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.
(1a) Select appropriate model for the problem.

(1b) Prepare a solution that exhibits logical sequence of steps that are consistent with the model.

(1c) Demonstrate a correct solution to the problem.

(1d) Present solution in appropriate format.

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Performance Indicator	5=Exemplary	4=Good	3=Adequate	2=Marginal	1=Unacceptable
Appropriate Model	Best model is selected for the problem.	A correct model is selected.	A correct model is chosen, but there are some conceptual errors.	Incorrect model is selected for the problem.	No model is selected for the problem.
Logically Consistent Solution	There is a complete and detailed sequence of steps to the solution.	There is a complete sequence of steps to the solution.	There is a correct sequence of steps to the solution.	There is a partially correct sequence of steps to the solution.	There is no logical sequence of steps to the solution.
Correct Solution	The solution is conceptually correct, with no procedural errors.	The solution is conceptually correct, with only minor procedural errors.	The solution is conceptually correct, but contains procedural errors.	The solution contains several conceptual or procedural errors.	The solution contains major conceptual or procedural errors.
Present Result	Presentation of results is detailed, well organized, and clear. All intermediate steps are shown.	Presentation of results is detailed and clear. All intermediate steps are shown.	Presentation is clear. All intermediate steps are shown.	Presentation is neat, but not all intermediate steps are shown.	Presentation is sloppy. Intermediate steps are not shown. Illegible.

Part 3: Course Schedule

The possibility exists that schedule changes will be necessary. Any changes will be clearly noted through Stony Brook email.

Week	Day	Date	Торіс	Assignments	Recitations
1	Tue	January 28th	Section 11.1		
	Thur	January 30th	Section 11.2		
	Fri	January 31st	Section 12.1		
2	Tue	February 4th	Section 12.2		
	Thur	February 6th	Section 12.3	Homework 1 Due	R01, R02, R03
	Fri	February 7th	Section 12.4		
3	Tue	February 11th	Section 12.5		
	Thur	February 13th	Section 12.6	Homework 2 Due	R01, R02, R03
	Fri	February 14th	Section 12.7		
4	Tue	February 18th	Section 12.8		
	Thur	February 20th	Section 13.1-a	Homework 3 Due	R01, R02, R03
	Fri	February 21st	Section 13.1-b		
5	Tue	February 25th	Section 13.2		
	Thur	February 27th	Section 13.3	Homework 4 Due	R01, R02, R03
	Fri	February 28th	Exam 1 Review		
6	Tue	March 4th	Section 14.1		
	Thur	March 6th	Section 14.2	Homework 5 Due	R01, R02, R03
	Fri	March 7th	Exam 1: Chapters 11-13		
7	Tue	March 11th	Section 14.3		
	Thur	March 13th	Section 14.4	Homework 6 Due	R01, R02, R03
	Fri	March 14th	Section 15.1		
8	Tue	March 18th	Spring Break		
	Thur	March 20th	Spring Break		
	Fri	March 21st	Spring Break		
9	Tue	March 25th	Section 15.2		
	Thur	March 27th	Section 15.3	Homework 7 Due	R01, R02, R03
	Fri	March 28th	Section 16.1		
10	Tue	April 1st	Section 16.2		
	Thur	April 3rd	Section 16.3	Homework 8 Due	R01, R02, R03
	Fri	April 4th	Section 16.4		
11	Tue	April 8th	Exam 2 Review		
	Thur	April 10th	Section 17.1	Homework 9 Due	R01, R02, R03
	Fri	April 11th	Section 17.2		
12	Tue	April 15th	Exam 2: Chapters 14-16		
	Thur	April 17th	Section 17.3	Homework 10 Due	R01, R02, R03
	Fri	April 18th	Section 17.4		
13	Tue	April 22nd	Section 18.1		
	Thur	April 24th	Section 18.2	Homework 11 Due	R01, R02, R03
	Fri	April 25th	Section 19.1		
14	Tue	April 29th	Section 19.2		
	Thur	May 1st	Section 19.3	Homework 12 Due	R01, R02, R03
	Fri	May 2nd			
15	Tue	May 6th	Final Exam Review		
	Thur	May 8th	Final Exam Review	Homework 13 Due	R01, R02, R03
	Fri	May 9th	Final Exam Review		
16	Tue	May 15th	Final Exam: Comprehensive	11:15AM - 1:45PM	

Part 4: Grading

Assessment and Grading:

Points you've earned for graded activities will be posted to Brightspace (automatically synced with McGraw-Hill connect)

Semester letter grade will be decided based on your aggregate score calculated as below:

- On-line Homework 20% (assigned through McGraw-Hill Connect)
- Hand Written Homeworks 10%
- Midterm-1 20% (Chapters 1-3)
- Midterm-2 20% (Chapters 4-6)
- Final Exam 30% (Comprehensive)

Your final letter grade may be curved (only to improve) and will be decided based on the above weights and your relative placement in the class. The following scale shows roughly what your final letter grade range might look like, where μ is the average, and σ is the standard deviation.



For Example, if for a specific class, the mean is 63.7 and the standard deviation is 16, the grades are assigned as is shown in the following table:

At least 1 standard deviations above the mean	79.7 -> 100	A> A
Between 0 (inclusive) and 1 (exclusive) standard	63.7 -> 79.6	B> B+
deviations above the mean		
Between 0 (inclusive) and 1 (exclusive) standard	47.7 -> 63.6	C> C+
deviations below the mean		
At least 1 standard deviations below the mean	0 -> 47.6	F -> D

Part 5: University and Course Policies

University Policies

Student Accessibility Support Center Statement:

If you have a physical, psychological, medical, or learning disability that may impact your course work, please contact the Student Accessibility Support Center, Stony Brook Union Suite 107, (631) 632-6748, or at sasc@stonybrook.edu. They will determine with you what accommodations are necessary and appropriate. All information and documentation is confidential.

Students who require assistance during emergency evacuation are encouraged to discuss their needs with their professors and the Student Accessibility Support Center. For procedures and information go to the following website: https://ehs.stonybrook.edu//programs/fire-safety/emergency-evacuation/evacuation-guide-disabilities and search Fire Safety and Evacuation and Disabilities.

Academic Integrity Statement:

Each student must pursue his or her academic goals honestly and be personally accountable for all submitted work. Representing another person's work as your own is always wrong. Faculty is required to report any suspected instances of academic dishonesty to the Academic Judiciary. Faculty in the Health Sciences Center (School of Health Professions, Nursing, Social Welfare, Dental Medicine) and School of Medicine are required to follow their school-specific procedures. For more comprehensive information on academic integrity, including categories of academic dishonesty please refer to the academic judiciary website at

http://www.stonybrook.edu/commcms/academic_integrity/index.html

Important Note: Any form of academic dishonesty, including cheating and plagiarism, will be reported to the Academic Judiciary.

Critical Incident Management:

Stony Brook University expects students to respect the rights, privileges, and property of other people. Faculty are required to report to the Office of Student Conduct and Community Standards any disruptive behavior that interrupts their ability to teach, compromises the safety of the learning environment, or inhibits students' ability to learn. Faculty in the HSC Schools and the School of Medicine are required to follow their school-specific procedures. Further information about most academic matters can be found in the Undergraduate Bulletin, the Undergraduate Class Schedule, and the Faculty-Employee Handbook.

Course Materials and Copyright Statement:

Course material accessed from Brightspace, Zoom, Echo 360, VoiceThread, etc. is for the exclusive use of students who are currently enrolled in the course. Content from these systems cannot be reused or distributed without written permission of the instructor and/or the copyright holder. Duplication of materials protected by copyright, without permission of the copyright holder is a violation of the Federal copyright law, as well as a violation of Stony Brook's Academic Integrity.

Calculator Policy:

Effective Spring, 2009 only the following calculators are being permitted to be used on all midterm and final exams in the Department of Mechanical Engineering. There will be no exceptions. This list of calculators is identical to that allowed for the National Council for Examiners for Engineering and Surveying (NCEES) Fundamentals of Engineering (FE) exam that many of you will take in your senior year as well as the Professional Engineering (PE) exam that you may take several years from now. The sooner you become comfortable on one of these calculators, the better.

NCEES Allowed calculators for 2025:

- Casio: All fx-115 or fx-991 models. Any Casio calculator must contain fx-115 or fx-991 in its model name.
- Hewlett Packard: The HP 33s and HP 35s models, but no others.
- Texas Instruments: All TI-30X and TI-36X models. Any Texas Instruments calculator must contain either TI-30X or TI-36X in its model name.

The NCEES policy on calculators can be found here: <u>https://ncees.org/exams/fe-exam/</u>

Make-up exam Policy:

The class policy on make-up exams is consistent with university policy on Student Participation in University Sponsored Events, the policy on Final Exams and the New York State Education Law regarding Equivalent Opportunity and Religious Absences.

- Student Participation in University Sponsored Events <u>http://sb.cc.stonybrook.edu/bulletin/current/policiesandregulations/policies_expec</u> <u>tations/participation_univsponsered_activities.php</u>
- University policy on Final Exams: <u>http://sb.cc.stonybrook.edu/bulletin/current/policiesandregulations/records_registr</u> <u>ation/final_examinations.php</u>
- New York State Education Law regarding Equivalent Opportunity and Religious Absences <u>http://sb.cc.stonybrook.edu/bulletin/current/policiesandregulations/policies_expec</u> tations/equivopportunity_religiousabsences.php

Incomplete Policy:

Under emergency/special circumstances, students may petition for an incomplete grade. Circumstances must be documented and significant enough to merit an incomplete. If you need to request an incomplete for this course, contact me for approval as far in advance as possible. You should also read the University's policies that apply to you:

Undergraduate Bulletin Graduate Bulletin

Understand When You May Drop This Course:

If you need to drop or withdraw from the course, it is your responsibility to be aware of the tuition liability deadlines listed on the registrar's <u>Academic Calendar</u>. Before making the decision to drop/withdraw you may want to [contact me or] refer to the University's policies:

- Undergraduate Course Load and Course Withdrawal Policy
- Graduate Course Changes Policy